C. Remarks

The claims are 1-23, with claims 1-3 being independent. Claims 1-3 have been amended solely to improve consistent use of terminology. These amendments are not related to patentability. No new matter has been added. Reconsideration of the present claims is expressly requested.

Claims 1-9 and 14-23 stand rejected under 35 U.S.C. § 103(a) as being allegedly obvious from JP 2003-51244 (Sato) in view of JP 2003-55768 (Seki). Claim 10 stands rejected under 35 U.S.C. § 103(a) as being allegedly obvious from Sato in view of Seki and further in view of U.S. Patent No. 6,656,007 B2 (Fushimi). Claims 11-13 stand rejected under 35 U.S.C. § 103(a) as being allegedly obvious from Sato in view of Seki and further in view of U.S. Patent No. 6,630,772 B1 (Bower). The grounds of rejection are respectfully traversed.

Prior to addressing the merits of rejection, Applicants would like to briefly discuss some of the features and advantages of the presently claimed invention. That invention, in pertinent part, is related to methods for manufacturing various structures containing carbon fibers. In particular, in this method, a substrate with a catalyst arranged on its surface is heated in a depressurized atmosphere that includes a carbon containing gas to grow carbon fibers by using the catalyst. A partial pressure of the carbon containing gas may be 1/1000 or less of a total pressure of the reduced pressure atmosphere, and may be 10 Pa or less. A total pressure of the reduced pressure atmosphere may be 2000 Pa or less or 600 Pa or less.

As a result of using the claimed combinations of total and partial pressures, the present invention leads to superior thickness uniformity of the deposited material, as well as to superior shape and configuration of the carbon fibers. Accordingly, devices with superior electron emission characteristics can be produced. The presently claimed invention overcomes the problems encountered by conventional low-pressure thermal CVD methods (see specification, page 4, lines 11-17).

Sato is related to a high efficiency electron discharge element. Sato discloses a method for growing a carbon fiber for use in an electron emitting member of an electron-emitting device using a catalytic particle via CVD. In the thermal CVD process disclosed in Sato, ethylene gas at 1Pa, acetone vapor at 0.1Pa, and acetylene gas at 0.5Pa are introduced as a material gas. The total pressure is not disclosed. Thus, while Sato discloses a partial pressure of the carbon containing material gas for use in growing carbon fibers, it fails to disclose or suggest a combination of such partial pressure with a specific total pressure for use in a thermal CVD process.

Seki is directed to a method for forming a laminar graphite-based film on a conductive substrate. Seki teaches growing the carbon fiber on a substrate according to a thermal CVD method with the total pressure in the chamber into which methane and hydrogen are introduced set at 1-10 Torr (≈133-1330Pa). No partial pressure of the carbon containing gas is disclosed. Thus, while Seki discloses the total pressure of the atmosphere in which the carbon fiber is grown, it fails to disclose using a combination of this total pressure with a specific partial pressure of the carbon containing gas.

As mentioned above, the presently claimed invention achieves superior results in terms of film thickness uniformity and the like in view of the specific combination of total and partial pressures. Applicants submit that the use of such combination of pressures is not at all obvious in view of the cited art.

Specifically, as mentioned in the specification (see page 4, lines 11-17), low-pressure thermal CVD methods have been used to form carbon fibers. However, merely lowering the pressure beyond a certain threshold still leads to film thickness deviations, and these deviations are difficult to avoid. The problem becomes even more pronounced as the formation region increases.

Applicants respectfully submit that Sato and Seki do not recognize that the above-discussed problems with uniformity cannot be solved by merely using a depressurized system. Applicants submit that both of these documents are silent with respect to the non-uniform film thickness and film growth over a large area. Accordingly, these documents cannot suggest a solution to the problems they fail to recognize.

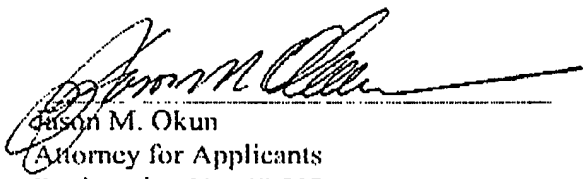
Applicants, however, solved the problems by controlling both the partial pressure of the carbon containing gas and the total pressure. As a result, carbon fibers can be grown with a reduced variation in film thickness even when the area of growth is large.

Neither Fushimi nor Bower can remedy the inadequacies of Sato and Seki. Fushimi is related to manufacturing of spacers. Bower is directed to a device, which contains a carbon nanotube field emitter structure. However, neither Fushimi nor Bower discloses or suggest the combination of pressures as presently claimed or the problems solved thereby.

Accordingly, whether considered separately or in any proper combination, the cited art does not disclose or suggest all of the presently claimed elements. Wherefore, Applicants respectfully request that the rejections be withdrawn and the application be expediently passed to issue.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



Jason M. Okun
Attorney for Applicants
Registration No. 48,512

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200

NY_MAIN 577303v1